Aviation S&T Strategic Plan (ASSP 2005)

The Vision and Technology Plan for the Integrated Manned and Unmanned Rotorcraft Fleet

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Aviation Applied Technology Directorate

Why - An S&T Strategic Plan Now?

- The “rate of change” in DoD is rapid and accelerating
- Aerial capabilities must support the transformation goals
- Promote Unity of Vision, Mission, and Community
- Provide clear, consistent strategy to DoD Leadership with buy-in from the Stakeholders.
- Provide a clear vision of success and a “path ahead” to include:
  - Strategic Goals
  - Alignment of S&T Strategic Partners
  - S&T Investment Strategy for the Future

We need to Revitalize the Aviation S&T Enterprise

Congressional Testimony on U.S. Rotorcraft Industrial Base

- The U.S. has and is continuing to lose jobs and revenue to foreign competition in the VTOL aerospace market.
- NASA and the DoD have made significant reductions in rotorcraft science and technology funding over the past few years that has a direct correlation with U.S. industry's global competitiveness.
- Beside Europe, new centers of rotorcraft technology and manufacturing capability are developing in India, China, Japan, Korea, and Canada.
- U.S. Military, Homeland Defense, and commercial markets are interdependent. Technologies and economies of scale from each market enable across-the-board development and cost efficiencies.
- The U.S. Government has neglected the rotorcraft sector of the industrial base.

National Crisis Exists!!!

Scope

- **Strategic**: The scope is to include a ***vision for the future*** and the investment strategy and infrastructure needed to achieve the vision.

- **S&T**: The scope is ***S&T only***, and does not include system development, engineering support, or other related business areas.

- **Joint Service VTOL Rotorcraft**: The scope is inclusive of the DoD ***Project Reliance*** responsibility for joint service rotorcraft S&T. The Army is assigned the DoD responsibility for meeting the Joint Service rotorcraft technology requirements.

- **Army Aerial Systems**: The scope includes ***all Army aerial*** vehicle systems, (manned or unmanned; fixed wing or rotary wing, VTOL-CTOL and everything in between) including the platforms, propulsion, associated mission equipment and payload integration, ground support equipment, logistical support, etc. necessary to develop, manufacture, operate, and maintain them.

- **Investment Strategy:** The scope covers the direction and strategy for the investment of Aviation S&T funding and the resultant capability transition. It is expected that the ***Strategic Partners*** will align to meet the total set of needs under a ***shared responsibility*** for S&T development. The investment will be prioritized and dependent upon these ***strategic alliances*** to meet the vision.

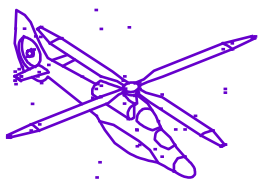
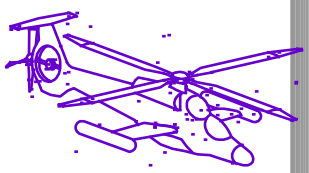
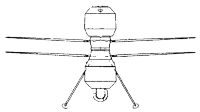
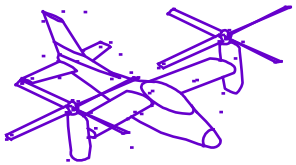
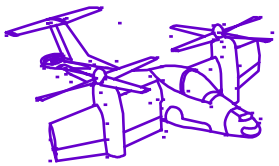
Definition of a Rotorcraft

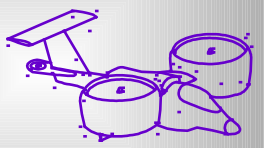
An air vehicle whose primary means of vertical lift is a rotating airfoil

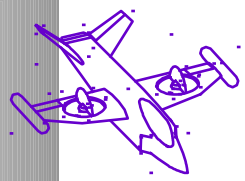
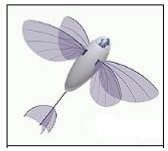
Is This Air Vehicle a Rotorcraft?

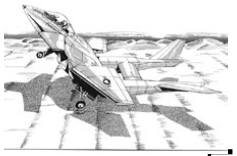
Yes **No**

Maybe

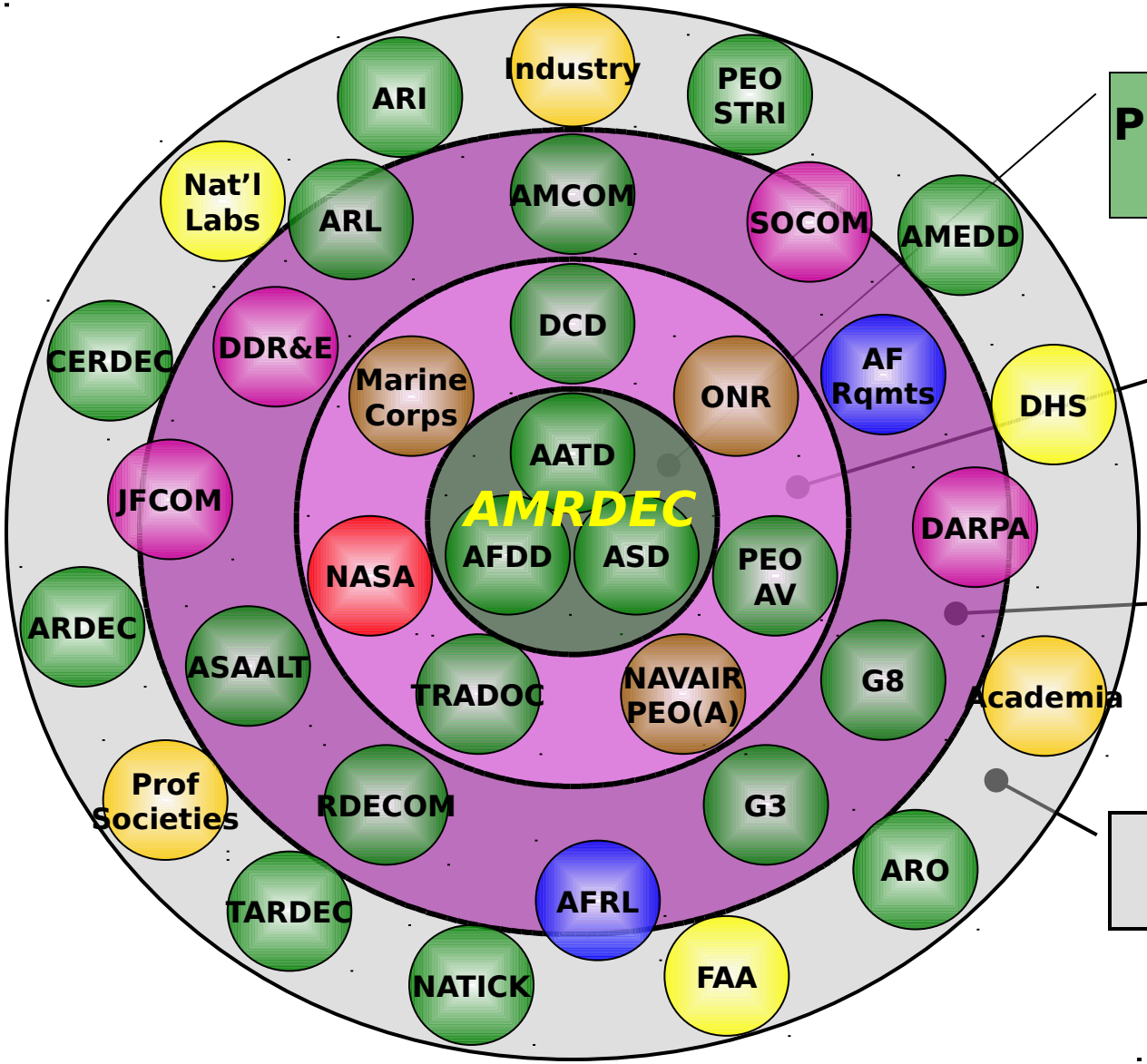










Aviation S&T Enterprise



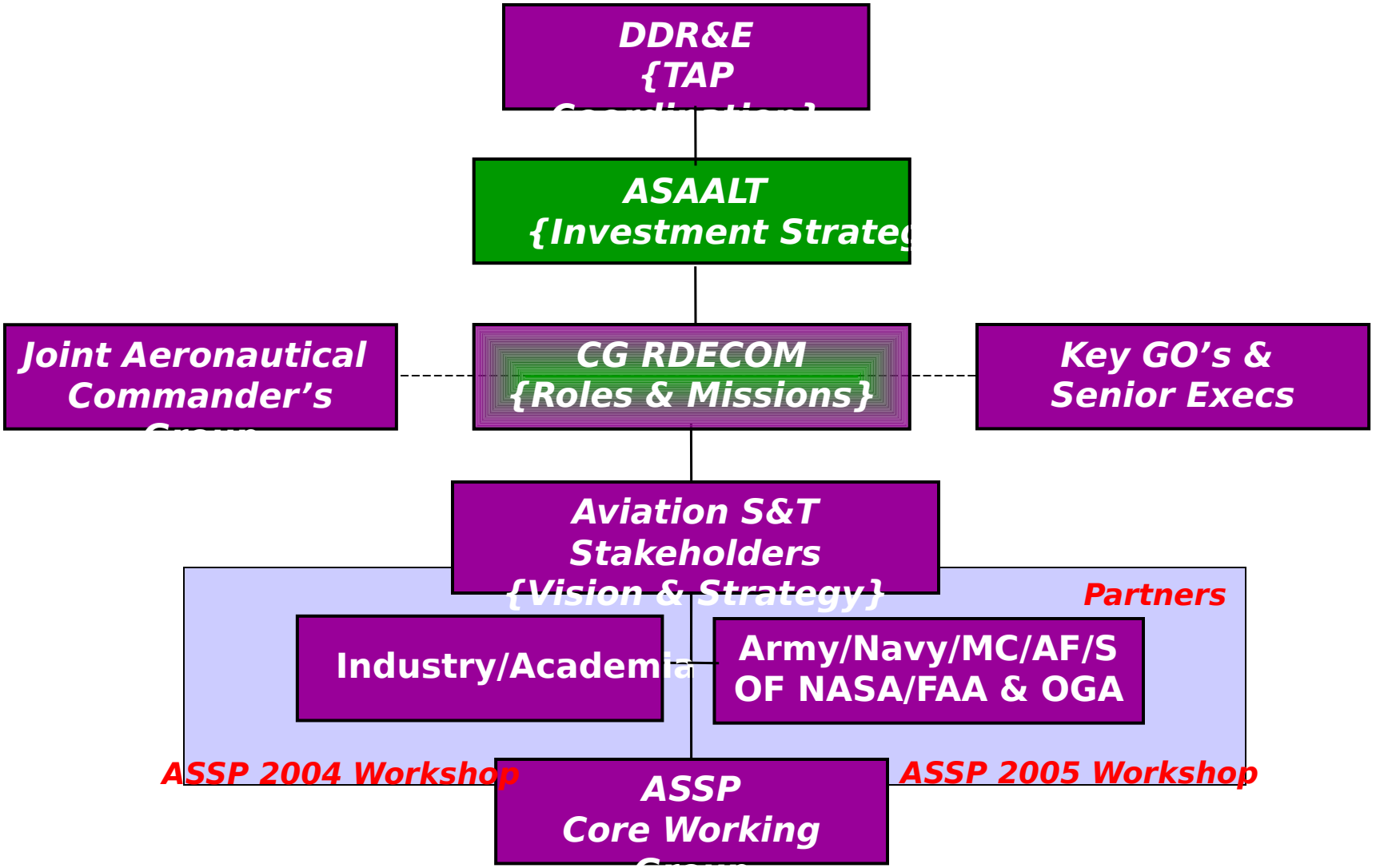
Project Reliance Lead

Core Working Group IPT

Stakeholders

Partners

Coordination Chain



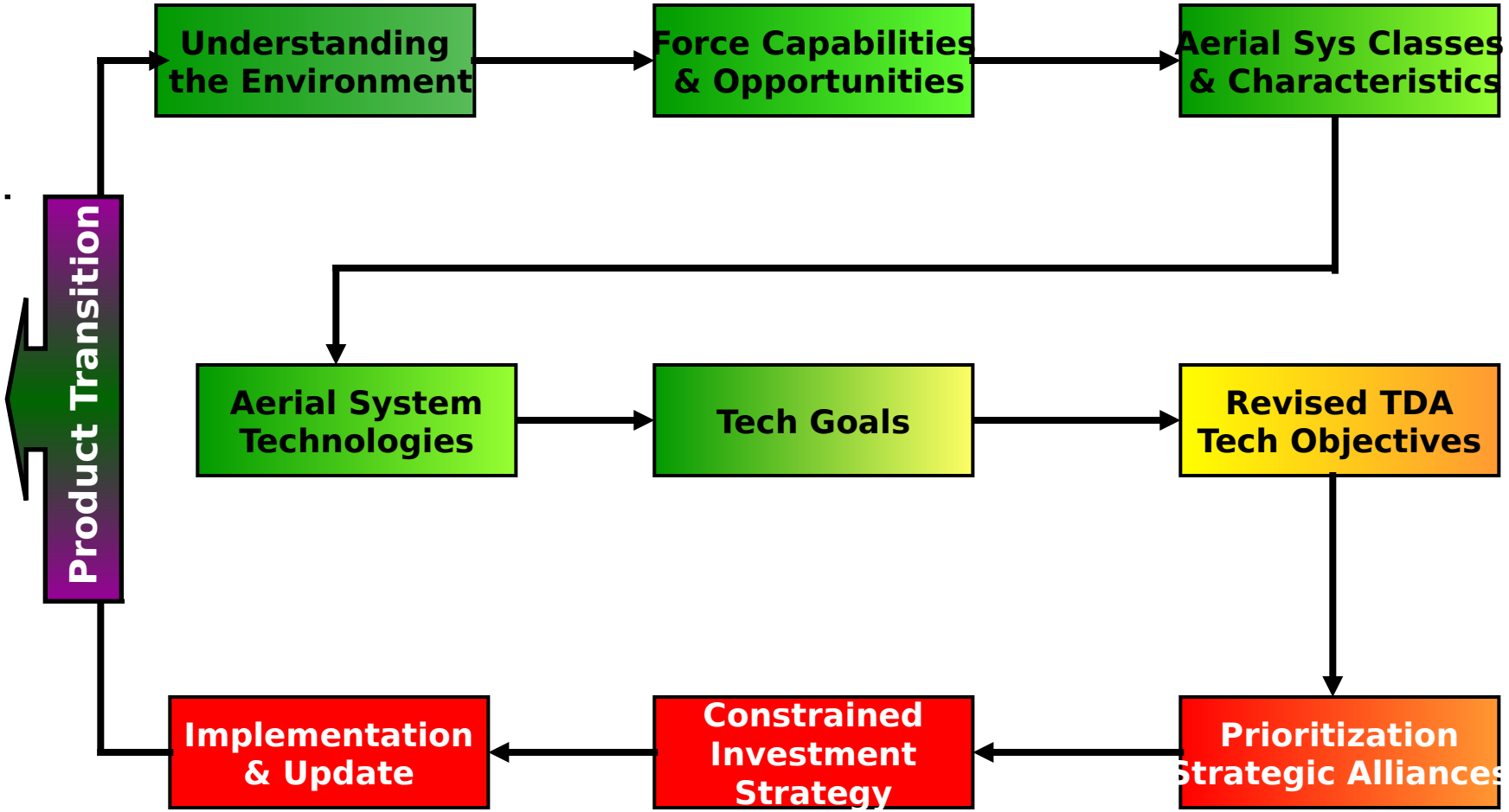
ASSP Products

- **Vision of Future Joint Aerial Capabilities**
  - Based on Relevant DOD/Joint Service/Army Vision/Transformation Objectives
  - Time Phased
  - Forward Thinking
- **Distillation of Joint Operational Capabilities and Derived Technical Objectives**
  - Needed to achieve the vision
  - Measurable Goals/Objectives
- **Joint Investment and Partnering Strategy - Create the Technical Capabilities**
  - Definitive Roadmaps to Goals (End-states)
  - Allocation of responsibilities/assets for achievement
  - Ownership and committed Stakeholders
- **Known and Communicative National Community United in Support of the Strategy**
  - Regular forum for dialogue and developing common understanding / positions
  - Clubhouse and membership (team building / integration)
- **Infrastructure Plan**
  - People
  - Facilities
  - Partnerships
  - Policies & Processes

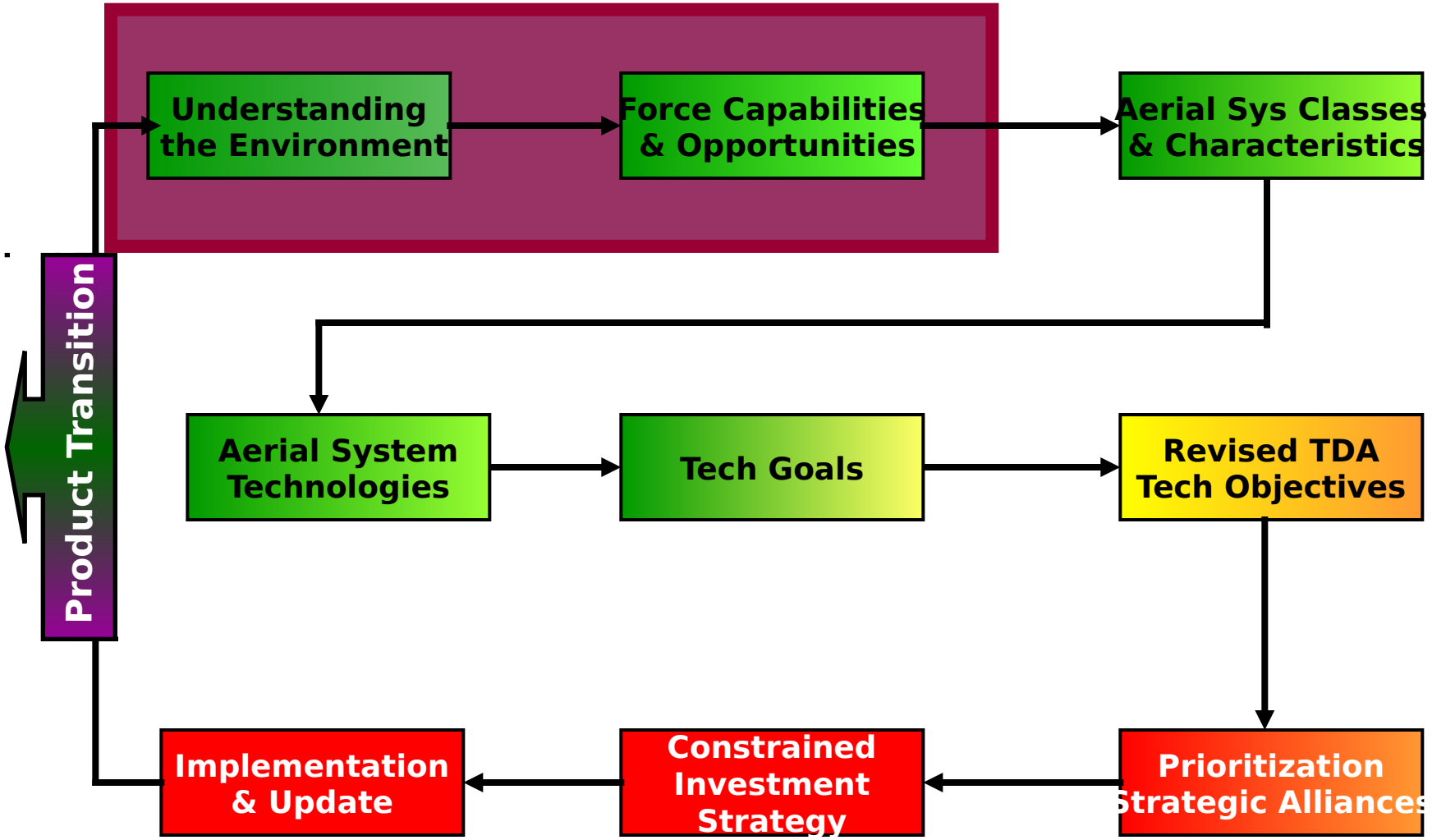
ASSP PROCESS

Flow and Status

ASSP Process Flow



Understanding the Environment



Understanding the Environment

Key Briefings

Key Reference Documents

Review And Analyze

"The Environment", Summary Brief

Vision

Affordable, full spectrum Joint Services VTOL rotorcraft systems and Army Aerial Systems with transformational capabilities that include/are:

- **Interoperable: Joint, Interagency, Multi-national**
- **Reduced operation and support footprint consistent with employment echelon**
- **Operations 24/7 in near all-weather and complex terrain**
- **Responsive global deployment and worldwide employment**
- **Full spectrum, distributed survivability/lethality**
- **Synergistic teaming of manned and unmanned systems**
- **Vertical maneuver of mounted forces**
- **Platform attributes consistent with joint air-ground operations**
- **All VTOL/VSTOL Marine Corps aviation**

ced National S&T Program & Infrastruct

Joint Force Capability Linkage

Derived from ASSP Context and DoD Capability Documents

Future Naval Capabilities

Marine Corps Strategy 21

FCS ORD JROC Approved

FCS KPPs

Future Naval Capabilities

- Autonomous Operations
- Capable Manpower
- Advanced Capability Electric Systems
- Fleet/Force Protection
- Knowledge Superiority & Assurance
- Littoral Antisubmarine Warfare
- Littoral Combat & Power Projection
- Missile Defense
- Organic Mine Countermeasures
- Total Ownership Cost Reduction
- Time Critical Strike
- Warfighter Protection

TRADOC FOCs

- Strategic Responsiveness & Deployability
- Battle Command Construct
- Sensor Fusion
- Mounted/Dismounted Maneuver
- Non-Line of Sight Lethality
- Line of Sight / Beyond Line of Sight
- Lethality for Mounted / Dismounted
- Air / Ground Operations
- Survivability
- Maneuver Support
- Maneuver Sustainment
- Training and Leader Development
- Human Engineering

Joint Vision 2020

Secretary of Defense Priorities

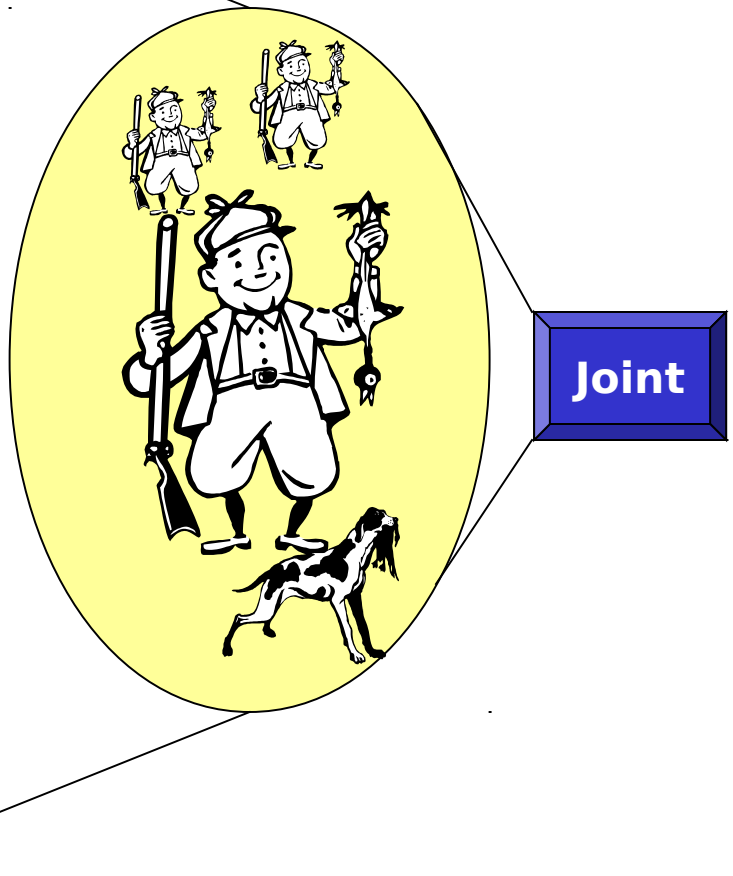
TRADOC PAM 525-66

Force Operating Capabilities

Human Functions Analogy

Basic Functions

- Sense
- Understand
- Decide
- Communicate
- Move
- Team
- Shoot / Attack
- Protect / Defend
- Care / Feed / Fix
- Learn / Adapt



Force Capability Areas

Derived from ASSP Context and DoD Capability Documents

Future Naval Capabilities

Marine Corps Strategy 21

FCS ORD JROC Approved

FCS KPPs

- **Sense, Assimilate & Understand**
- **Network Comm / Battle Command**
- **Expeditionary Deployment**
- **Maneuver**
- **Maneuver Support**
- **Cooperative / Collaborative Teaming**
- **Offensive Effects / Lethality**
- **Force Protection / Survivability**
- **Sustainment / Logistics**
- **Proficiency / Adaptability / Training**

Joint Vision 2020

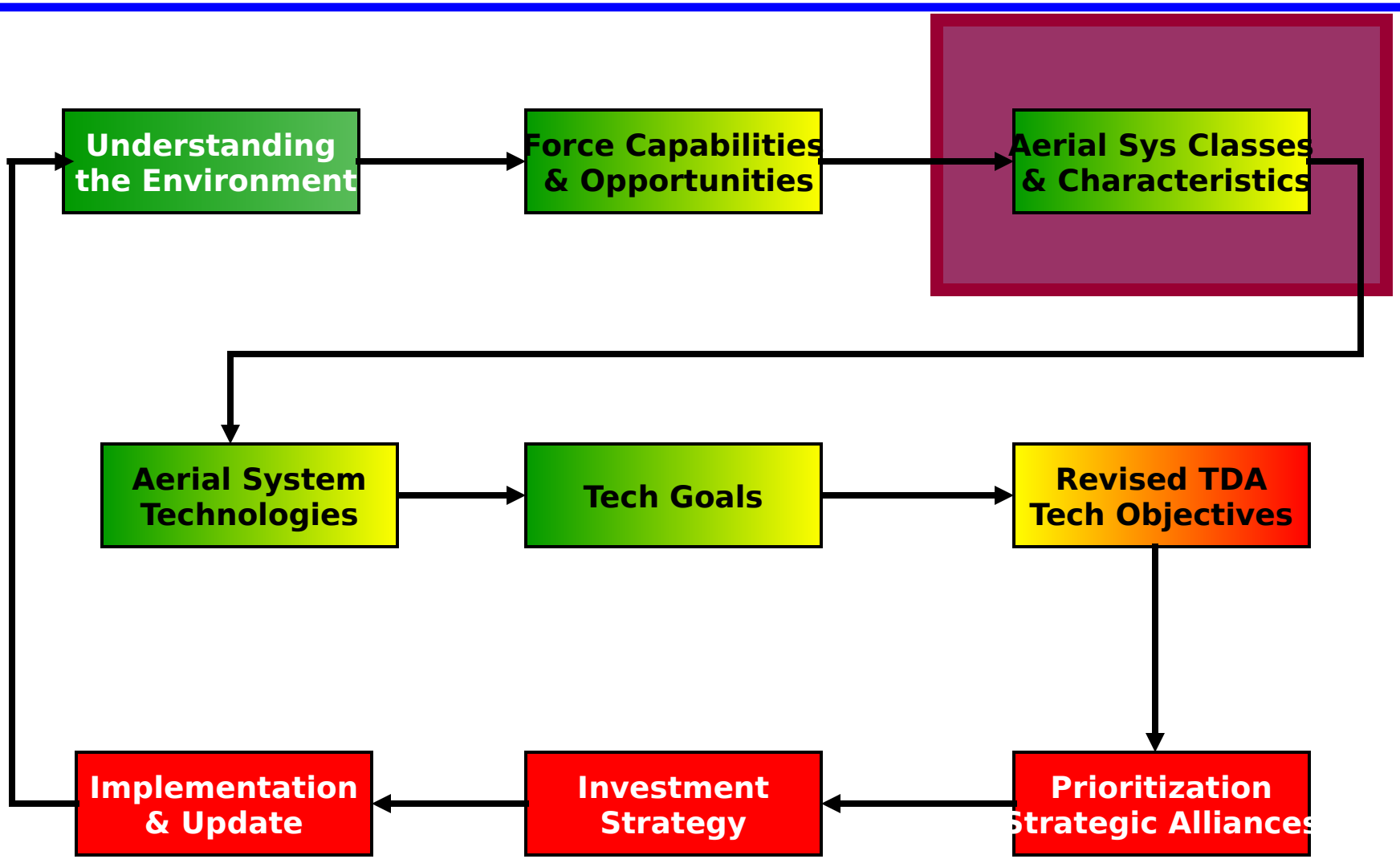
Secretary of Defense Priorities

TRADOC PAM 525-66

Force Operating Capabilities

Go To Force Capability Brief

Aerial System Classes & Characteristics



Air Vehicle Classes*

Operational Considerations

Aviation Core Competencies:

- Reconnaissance
- Attack
- Lift (Utility & Cargo)
- Command & Control

Favorable Cost of Ownership:

- Research & Development
- Procurement
- Sustainment
- Force Structure

Echelon:

- Team - to - Theater

Payload:

- Passengers
- Weight & Cube
- Mission Equipment

Technical Considerations

Aviation System Characteristics:

- Size
- Weight
- Speed
- Type
- Endurance
- Reliability
- Severe Geographical & Environmental Extremes

* Includes Manned and Unmanned Systems

Current-to-Future -- Force Trends

- Full Spectrum Operations
  - Future Force Equals Joint Force Operations
  - Strategic, Operational & Tactical Mounted Maneuver Concepts
- UAVS Integrated Throughout The Force
  - Proliferation of UAVS In Near-Mid-Far Term
  - Intelligence Systems In Production & Being Fielded
  - Maneuver Systems For Reconnaissance, Attack, Utility & Cargo In Concept Development
  - Capable Of Doing "The Dirty, Dull & Dangerous"
- Multi-Mission / Multi-Purpose Platforms
  - Trend Is For Fewer Manned Platforms In The Future
  - Goal - Reduced Procurement and Support Costs
  - Operational Benefits Might Not be As Clear (More w/Less)
- Greater Emphasis On Reducing O&S Costs
  - Future Operations Extended to Support Peacekeeping efforts
  - Extended Ranges Significantly Increase RW Flight Hours
  - Mix Of RW & FW Required To Meet Force Demands

Aerial Platform Trends*			
USA:	21:20		↓
5%			↓
RW:	12:9	25%	↑
UAV:		3:8	↓
160%			↓
FW:	6:3	50%	↓
USMC:	11:9	19%	↔
RW:	9:7	22%	↓
UAV:		2:2	↓
USN:	6:3	50%	↑
RW:	6:2	66%	↔
UAV:	0:1	100%	↔
USAF:	4:4		↔
____		RW:	
	3:3		
UAV:	1:1		

* SOF Numbers Included In Service Totals

How to Classify Aerial Systems?

What drives the technology that should be worked on?

- **Mission ?**
- **Configuration?**
- **Specific Characteristics?**
- **Payload?**
  - **Weight**
  - **Dimensions**
- **Take-Off Gross Weight (TOGW)?**

Biggest Driver of Technology Needs:

Overall Dimensions (Size),

for which TOGW is a good surrogate

Generic Aerial System Classes

Technical View

	TOGW (lbs)	
Class 0	<8	
Class I	8-32	Unmanned
Class II	33-200	
Class III	201-1500	
Class IV	1501-7500	
Class V	7501-75000	Manned & Unmanned
Class VI	> 75000	

~ Army FCS

Class 6 - Aerial System

Typical Missions: LOTS, STOM, VERT REP, VMM, SOF
Attributes: Cargo/Troop/Vehicle delivery system with rapid load/unload capability. Internal & Ext loads. Land based, Shipboard capable. {Growth land & sea based}. Aerial refueling capable. Supports Expeditionary Ops. Net ready.
Aircraft Type: VTOL or Hybrid
Manned System: Dual pilot / Single pilot operable
Echelon: UE/MEF/MEB/CSG/ESG
Environment: World-wide Perf (SL/103 – 6K/95+)
TRL 6: 2015

Notional System Characteristic

Gross Weight:	**>75,000 lbs**
Design Life:	**10,000 Hrs (6000 I**
Payload:	**20-25 Tons**
Range:	**500-1000 km**
Speed:	**>175 kts**
Autonomy:	**Level 4-6**
Sustainment:	**90% OR Rate**
Footprint:	**UE/MEF Consistent**
Survivability:	**Full Spectrum**
Transportability:	**Shipboard**
Self Deployability:	**4000 km**

Shipboard Compatible

Optionally Piloted

Automated Int/Ext Load Mgt & Capture

Advanced Cargo Handling

Class 4 - Aerial System

Typical Missions: Attack, Recon, Utility, VERT REP, SOF
Attributes: Internal & Ext loads. Land & Sea based. Aerial refueling capable. Supports Expeditionary Ops. Net ready.
Aircraft Type: VTOL, Hybrid or FW
Unmanned: ATOL&F in Complex Terrain / OOV
Manned: Single pilot / OPV
Echelon: Av Squadron / MEF/MEB/MEU/CSG/ESG
Environment: World-wide Perf (SL/103 – 6K/95+)
TRL 6: 2015

Notional System Characteristics

Gross Weight:	1501- 7500 lbs
Design Life:	10000 Hrs
MTBC:	3,000 hrs
Payload:	35-65% GW
Endurance:	5-48 Hrs
Range:	100-1000 km
Speed:	100-300 kts
Autonomy:	Level 6-8
Sustainment:	90% OR Rate
Footprint:	UA Consistent (Squadr
Survivability:	Balanced
Transportability:	C-130, C-17, Class

UA CRP

Persiste nt Stare

Adv Targeting & Tra

Automated Emergency Casualty Evac

Airborne Netfires

Robotic Wingman

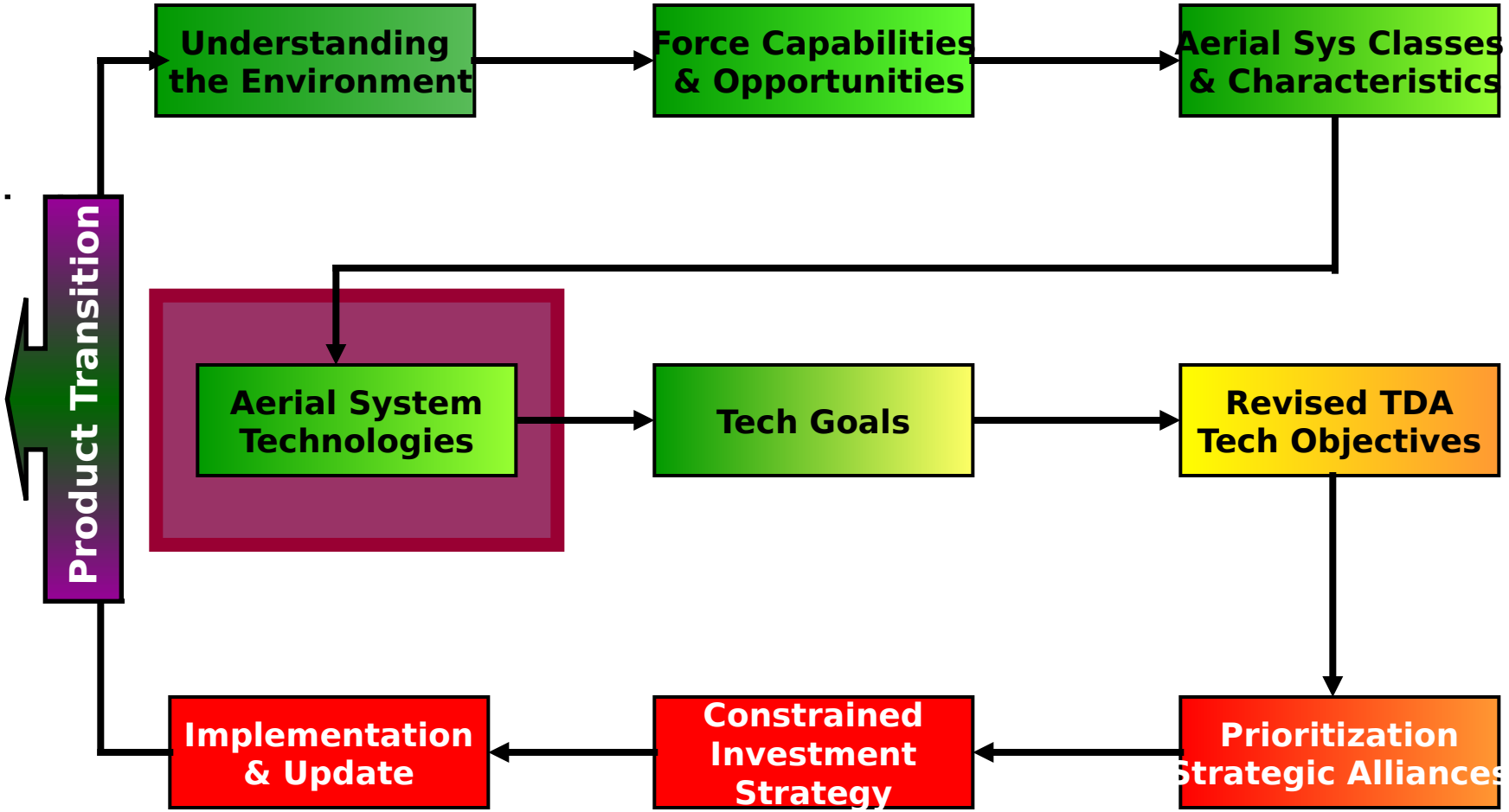
ATA & ATG Engageme nt

OTM Mine

Force Protection Autonomous Patrols Armed Recon

Autonomous Retail Delivery with Automated Load Mgt & Capture

Aerial System Technologies

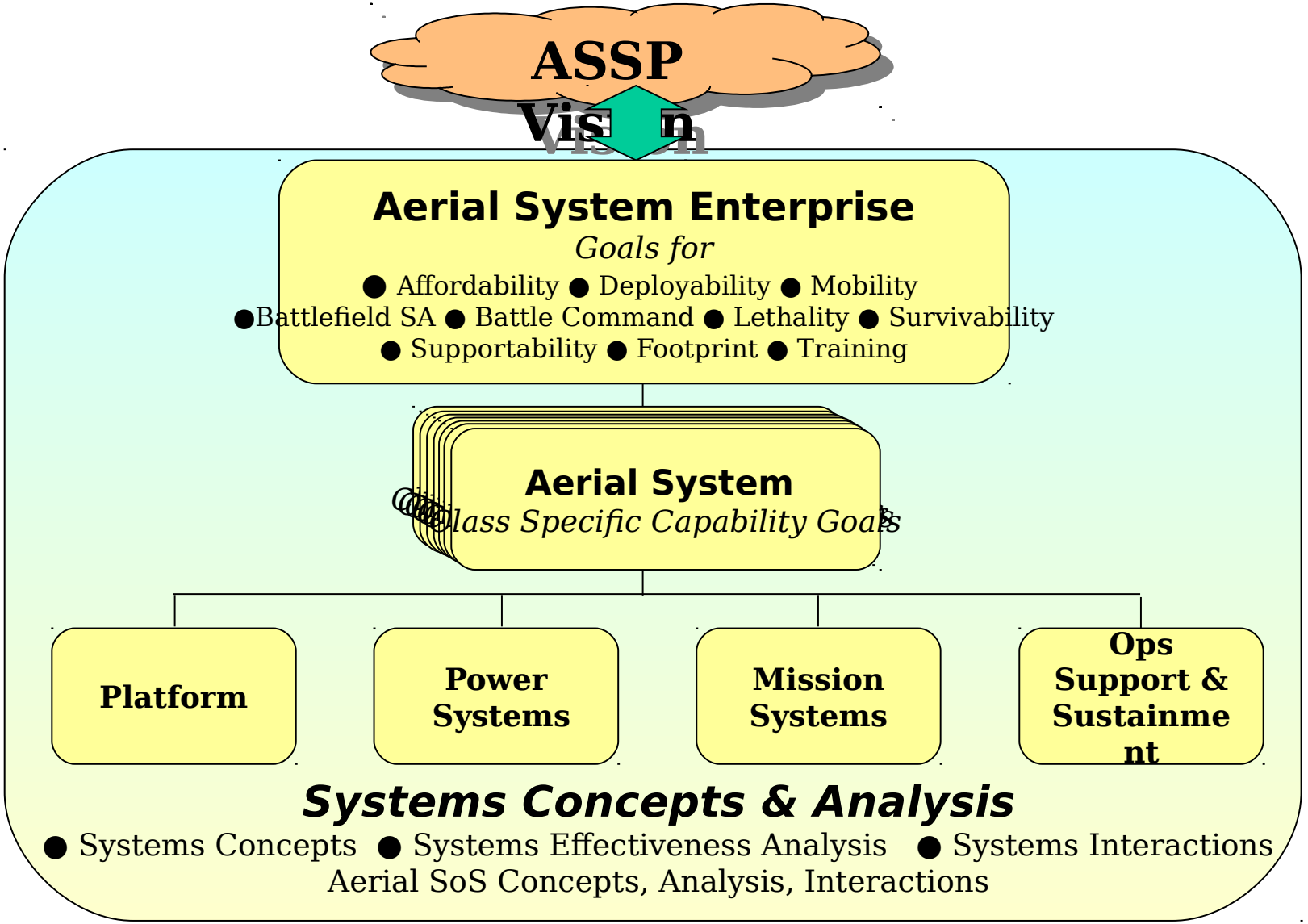


ASSP Aerial Systems S&T Taxonomy Focus & Technology Areas

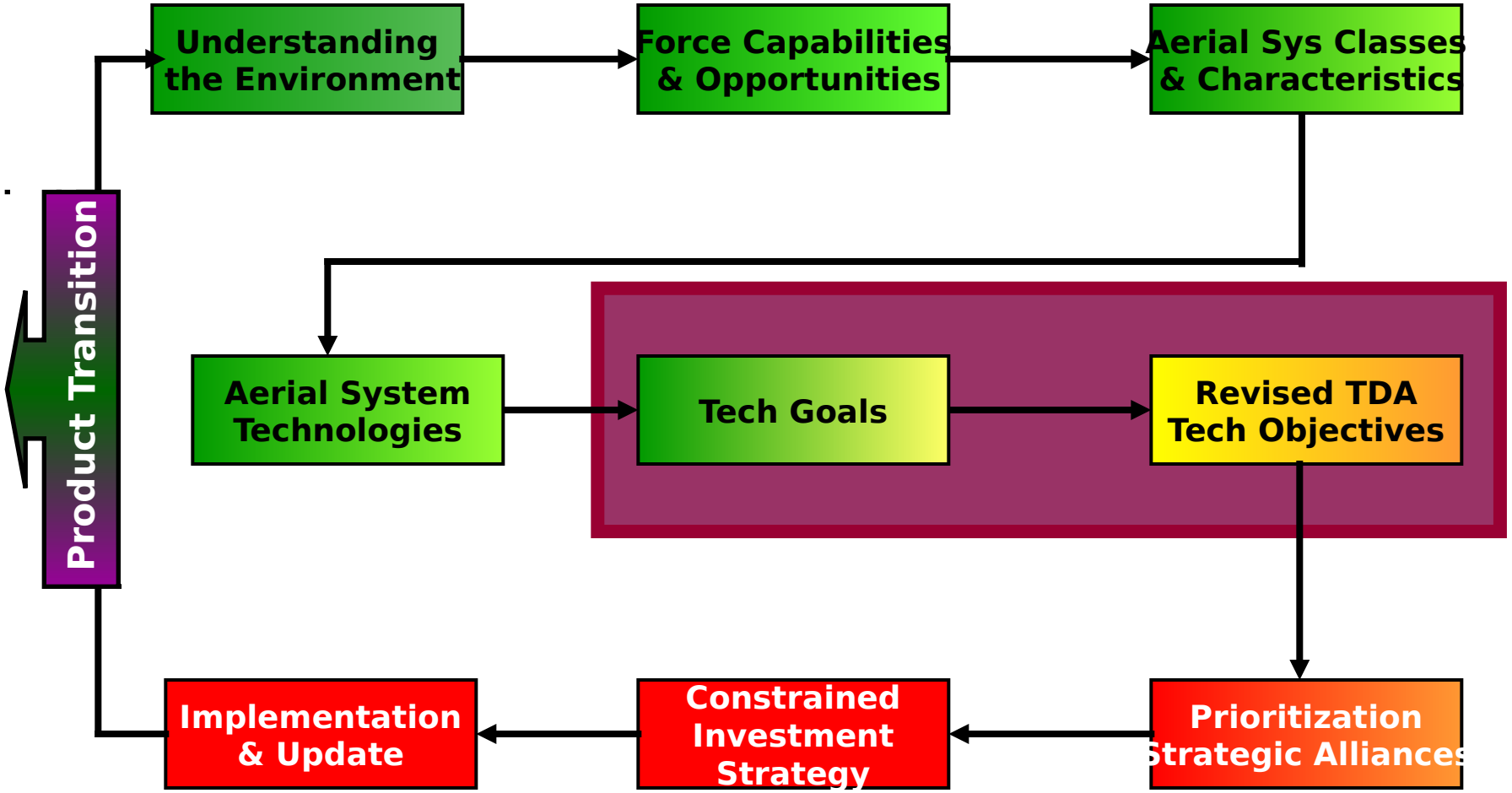
- **Platform**
  - Structure
  - Force & Moment Generators
  - Vehicle Mgt & Control
  - Subsystems
- **Mission Systems**
  - Engagement and Effects
  - Survivability
  - Teaming, Autonomy & Info Mgmt
  - Human Sys Interface
  - Avionics/Networking
- **Power**
  - Engines & Motors
  - Other Power Sources
  - Drives & Power Transmission
- **Operations Support & Sustainment**
  - Sustainment
  - Flight Operations
- **Systems Analysis and Concepts**
  - Aerial System Concepts Evaluation
  - Analyze System Effectiveness in JIM

erial Systems Taxonomy is more than the RWV constru
eromechanics/ Drive Systems/Structures/ Subsystems/Flight Control

Taxonomy Relationship



Technology Goals



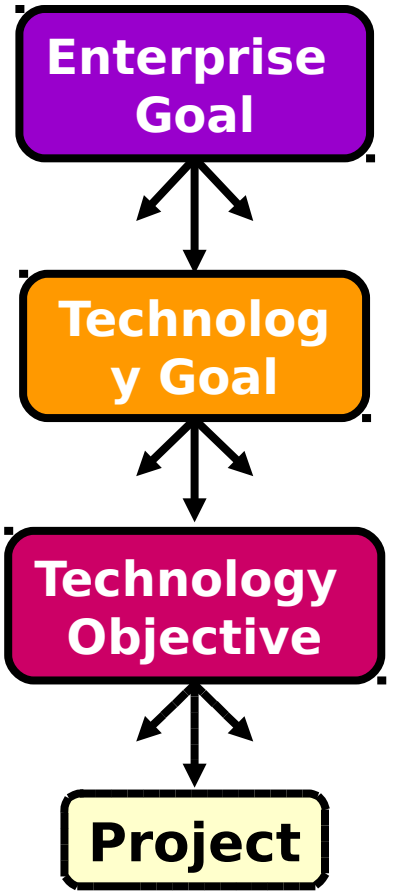
Aerial System Enterprise Goals

Affordability:	50% Reduction in Dev/Prod/O&S Cost
Footprint:	50% Reduction
Deployability:	Brigade in 96 hrs (To be revised)
Supportability:	90% OR
Battle Command: time	25% Reduction in response
Battlefield Situational Awareness:	100% Blue/95% Red within AOR
Lethality:	97% Effects on target
Survivability:	80% Red. in Blue Aerial Systems Losses
Mobility: Range/End/Payload	3X Improvement in
Training:	Equiv. Proficiency @ 1/2 time

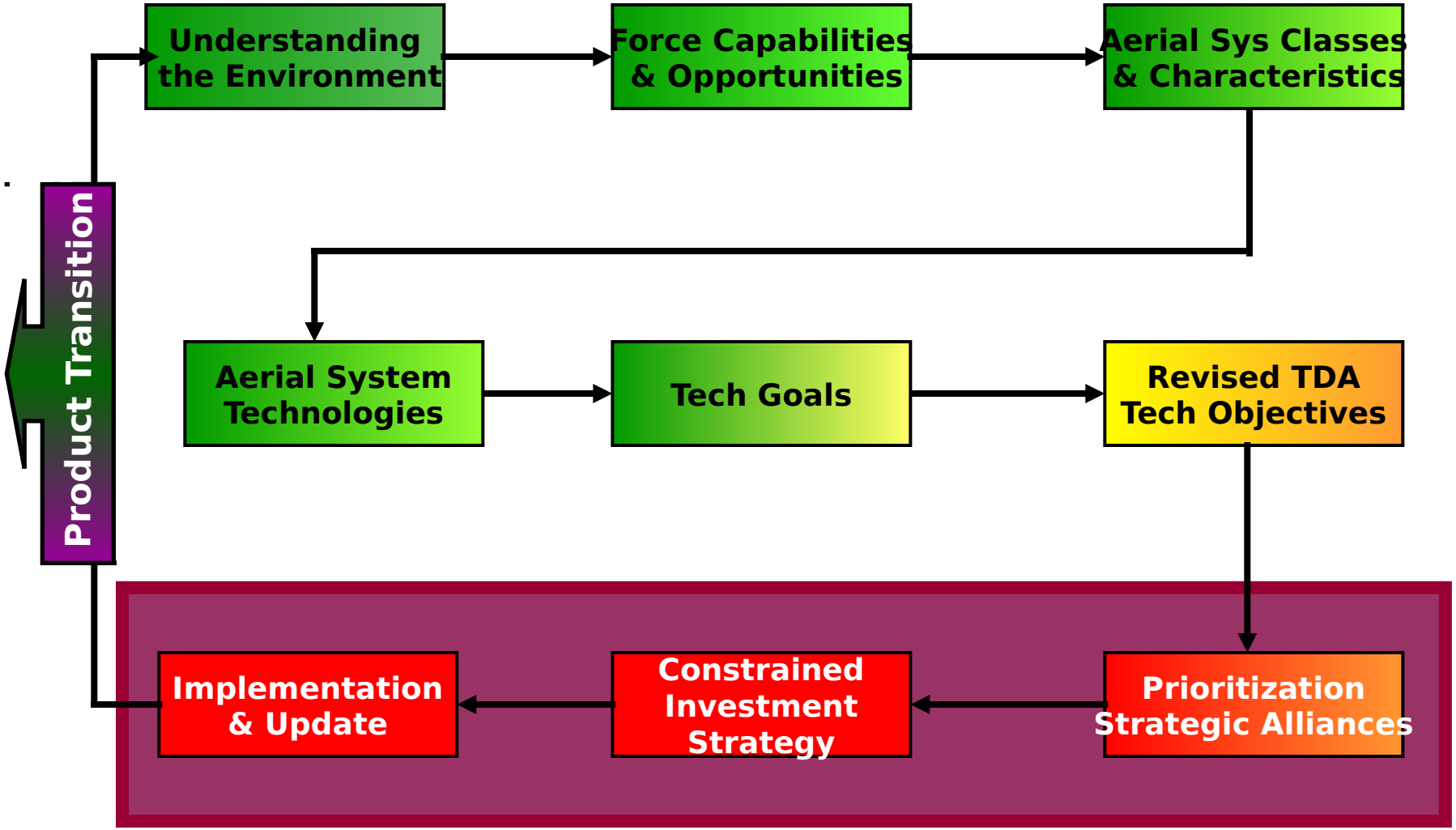
Draft

Approach to TDA Connectivity

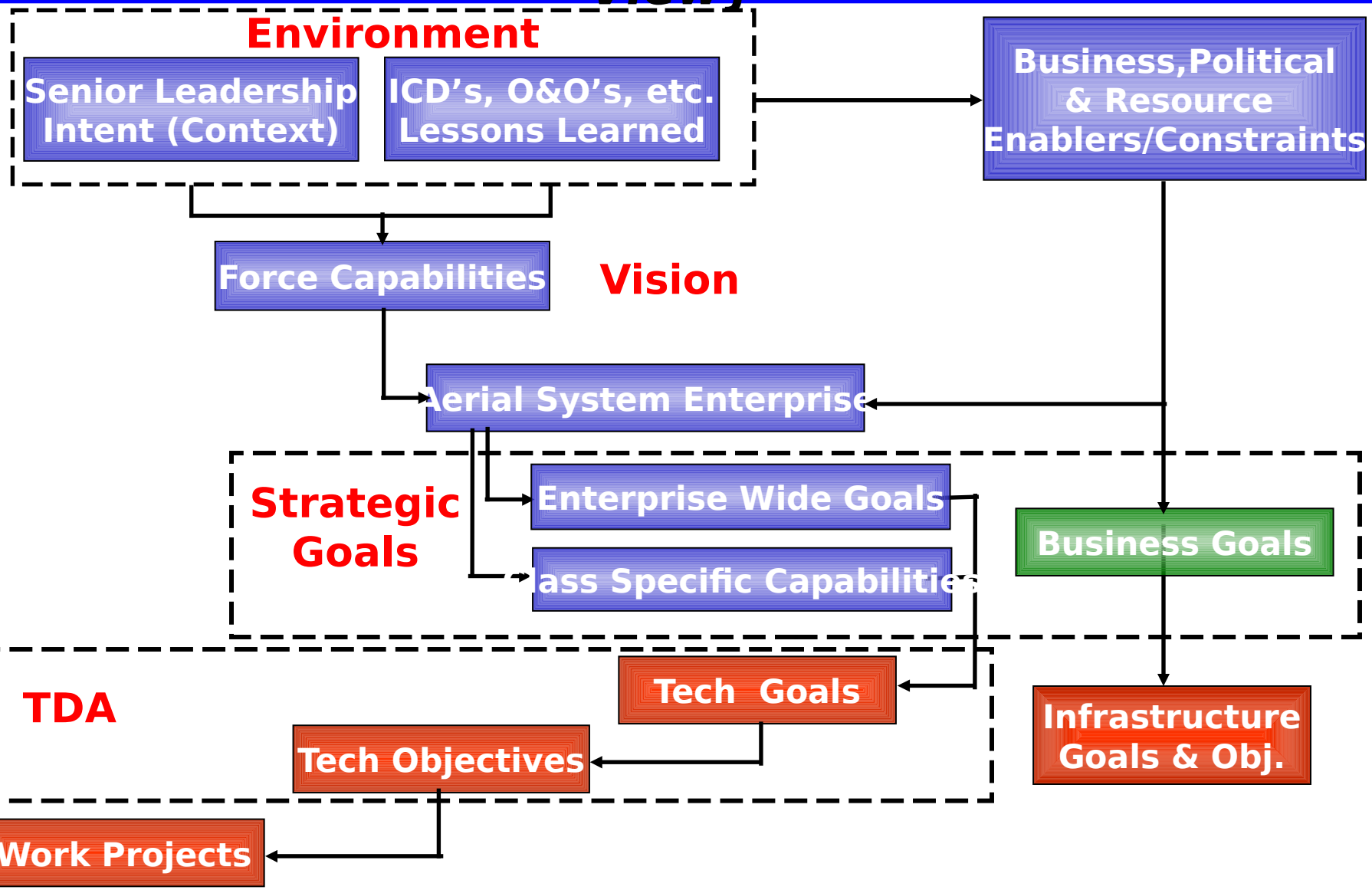
- The TDA consists of 3 hierarchical levels
  - **Enterprise Goals** (Top Level)
  - **Technology Goals** (Mid Level)
  - **Technology Objectives** (Bottom Level)
- **Enterprise Goals** are to be decomposable into (and connectable) to **Technology Goals**
- **Technology Goals** are to be decomposable into (and connectable) to **Technology Objectives**
- A **Project** (a/k/a a "Work Package") is the embodiment of one of potentially several approaches to accomplishing a **Technology Objective**



Aerial System TDA
Tech Objectives



ASSP Process Flow {A Technology & Business Balanced View}



Enterprise Business Issues

- Workforce
  - Depth & Breadth
  - Skills, Discipline, & Age Distribution
  - Utilization & Focus
- Leadership
  - Strategic Focus
  - Objective Decisiveness
  - Roles & Responsibilities Alignment
  - Risk Tolerance
  - Commitment, Enthusiasm, Energy
- Organization
  - % Captured Capability
  - Clear and Non-Overlapping Missions, functions, facilities, & skills
  - Internal and External Competition
  - Reward System - Individual or Team
- Culture
  - Reactive or Proactive
  - Competitive or Cooperative
  - Change Tolerance
  - NIH
  - Component Or Systems Perspective
  - Competition or Sole Source Orientation
- Processes
  - Workload distribution - Overburdening
  - Financial Management
  - Personnel Management
  - Product Transition and Transfer
  - Non-Productive Requirements
- Resources
  - Funding
  - Personnel
  - Facilities (Tools & Equipment)

Strategic Elements Completed

- **Joint S&T Enterprise Definition**
  - Community of Stakeholders & Partners
  - Recognition & Acceptance of Joint Responsibility
  - Promotion & Dialog within the Community
- **Joint Strategic Planning Process**
  - Stakeholders & Partners: Government & Industry
  - Capabilities, Systems, Technologies, & Priorities
- **ASSP Vision Statement**
- **Definition of Aerial System Classes**
  - Joint, Big Picture Context
  - Capabilities and Characteristics Relevant to Each
- **Redefinition of Holistic System Taxonomy**
  - Platform, Power, Mission Systems, Ops Support & Sustainment , Systems Concepts & Analysis
- **Establishment of Holistic Focus & Technology Areas**
- **Enterprise Goals & Derived Technology Goals**

mmunity, Commitment, Communicati

ASSP 2005 – Path Ahead

- **Develop a Tactical Prioritization Process**
  - **Army Aviation Investment**
  - **Follows Strategic Tenets**
  - **Accounts for All the "other" considerations (Organizational Health, Congressional Interest, Technology State & Payoff, etc.)**
- **Develop Strategic Investment Plan**
  - **Enterprise Level Focus to Achieve Technology Goals**
  - **Investment Tenets (Classes,Competencies, etc.)**
  - **Interdependent Partnerships**
- **Develop Framework for Revised Aerial System TDA**
  - **Consistent with Systems Level Taxonomy**
  - **Meets TARA 2004 Tasking**
- **Describe Continuing S&T Planning Activities for:**
  - **Revised TDA Completion**
  - **Developing Technology Roadmaps (Program Plan)**
  - **Conducting & Maintaining Technology Status Assessments**
  - **Addressing Business Practice Improvements**

Questions?